

SECTION 11331

OIL/WATER SEPARATOR
5/98

PART 1 GENERAL

1.1 REFERENCES

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

AMERICAN NATIONAL STANDARDS INSTITUTE, INC. (ANSI)

ASME B16.3 (1992) Malleable Iron Threaded Fittings

ASME B31.1 (1995; B31.1a; B31.1b) Power Piping

AMERICAN SOCIETY OF MECHANICAL ENGINEERS (ASME)

ASME BPV IX (1995; Addenda Dec 1995, Dec 1996) Boiler and Pressure Vessel Code; Section IX, Welding and Brazing Qualifications

AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM)

ASTM A 53 (1996) Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless

ASTM C 231 (1997) Air Content of Freshly Mixed Concrete by the Pressure Method

ASTM C 850 (1994) Precast Reinforced Concrete Box Sections for Culverts, Storm Drains, and Sewers with Less Than 2 Ft. of Cover Subjected to Highway Loadings

ASTM D 1599 (1988) Short-Time Hydraulic Failure Pressure of Plastic Pipe, Tubing, and Fittings

ASTM D 1751 (1983; R 1991) Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

ASTM D 1752 (1984; R 1996) Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction

ASTM D 2996 (1995) Filament-Wound "Fiberglass" (Glass-Fiber-Reinforced Thermosetting-Resin) Pipe

AMERICAN WELDING SOCIETY (AWS)

AWS D1.1 (1996) Structural Welding Code - Steel

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 30 (1996; Errata) Flammable and Combustible Liquids Code

STEEL STRUCTURES PAINTING COUNCIL (SSPC)

SSPC SP 10 (1994) Near-White Blast Cleaning

UNDERWRITERS LABORATORIES (UL)

UL 58 (1996) Steel Underground Tanks for Flammable and Combustible Liquids

UL 1316 (1994) Glass-Fiber-Reinforced Plastic Underground Storage Tanks for Petroleum Products, Alcohols, and Alcohol-Gasoline Mixtures

1.2 GENERAL REQUIREMENTS

If any departures from the provisions of this section of the specification are deemed necessary by the Contractor, details of the reasons thereof shall be submitted as soon as practicable to the Contracting Officer for consideration. No such departures shall be made without prior written approval of the Contracting Officer. Refer to SECTION: PLUMBING, GENERAL PURPOSE and SECTION: HOT WATER HEATING SYSTEM, OIL FIRED, for additional requirements. All buried metal in contact with soil shall be protected by coating or wrapping, as specified hereinafter.

1.2.1 Name Plates

Each major component of equipment shall have the manufacturer's name, address, type or style, model or serial number, and catalog number on a plate secured to the item of equipment. Name plates shall be provided for:

Oil/Water Separator
Leak Detection and Monitoring System

1.2.2 Permits to Operate

The Contractor shall provide required permits to construct oil/water separator, per local agency regulations, and pay costs as required. Permits shall be posted under glass.

1.2.3 Certificates of Tests

As soon as practicable and within 30 days after the award of the contract and before the oil/water separator, and system are purchased, the Contractor shall submit certificates stating that all items to be furnished will be manufactured by firms which regularly produce such materials in accordance with NFPA and UL Standards and State of Arizona Health and Safety Codes.

1.2.4 Welding

Piping shall be welded in accordance with qualified procedures using performance-qualified welders and welding operators. Procedures and welders shall be qualified in accordance with ASME Section IX. Welding procedures qualified by others, and welders and welding operators qualified by another employer may be accepted as permitted by ANSI B31.1.

Contracting Officer shall be notified 24 hours in advance of tests and the tests shall be performed at the work site if practical. The Contracting Officer shall be furnished with a copy of qualified procedures and a list of names and identification symbols of qualified welders and welding operators. The welder or welding operator shall apply his assigned symbol near each weld he makes as a permanent record.

1.3 SUBMITTALS

Government approval is required for submittals with a "GA" designation; submittals having an "FIO" designation are for information only. The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES:

SD-01, Spare Parts Data

Spare Parts; FIO.

The Contractor shall furnish data for each different item of materials and equipment specified, in accordance with Section, 01330, SUBMITTAL DESCRIPTIONS. The data shall include a complete list of parts and supplies, with current unit prices and source of supply.

SD-04, Shop Drawings;

Shop Drawings; GA.

Shop drawings shall be submitted in accordance with Section 01330, SUBMITTAL DESCRIPTIONS and shall consist of a complete list of equipment and materials, including manufacturer's descriptive and technical literature; performance charts and curves; catalog cuts; and installation instructions. Shop drawings shall also contain complete wiring and schematic diagrams; and any other details required to demonstrate that the system has been coordinated and will properly function as a unit. Drawings shall show proposed layout and anchorage of equipment and appurtenances, and equipment relationship to other parts of the work including clearances for maintenance and operation.

SD-09, Performance Test Reports;

Performance Test Reports; FIO.

Upon completion and testing of the installed system, test reports shall be submitted in booklet form showing all field tests performed to adjust each component and all field tests performed to provide compliance with the specified performance criteria. Each test report shall indicate the final position of controls.

SD-19, Operating and Maintenance Instructions;

Operating and Maintenance Instructions; FIO.

instructions outlining the step-by-step procedures required for system start-up and operations shall be furnished in accordance with Section 01330, SUBMITTAL DESCRIPTIONS. The instructions shall include the manufacturer's name, model number, service manual, parts list, and brief description of all equipment and their basic operating features.

Maintenance instructions listing routine maintenance and cleaning procedures, possible breakdowns and repairs shall be furnished. The instructions shall include simplified diagrams for the system as installed.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

Materials and equipment shall conform to the respective publications and other requirements specified herein.

2.1.1 GENERAL

The oil/water separator shall be double-wall type constructed of mild steel plate, glass fiber reinforced polyester resin (FRP) or concrete.

The oil/water separator shall be fabricated and tested in accordance with Underwriters' Laboratories and NFPA standards. The tank shall be UL listed. The oil/water separator shall be suitable for underground installation and shall be constructed and labeled in accordance with NFPA No. 30. The oil/water separator shall be secured to concrete cradles sized and designed to prevent flotation of an empty oil/water separator when ground is saturated with water. The oil/water separator shall have a manhole opening not less than 610 mm in diameter and a matching watertight steel cover. Oil/water separator and anchoring straps shall be electrically insulated.

2.1.1.2 Construction

Construction shall be double-wall type in accordance with the State Health and Safety regulations for underground storage of hazardous substances. Provision shall be made for detecting leaks in the oil/water separator.

2.1.2 Steel Plate Oil/Water Separator

Steel plate oil/water separators shall be all welded. Oil/water separator shall be fiberglass resin coated. Steel tank, oil/water separator, and anchoring straps shall be electrically insulated.

2.1.2.1 Glass Fiber Reinforced Polyester Coating

Exterior coating of the oil/water separator shall be shop applied using glass fiber conforming to MS MIL-Y-1140 and corrosion resisting grade polyester resins meeting the Grade B (superior) requirements of MS MIL-R-7575 for physical strength. The exterior of the oil/water separator shall be prepared by removing all weld spatter and rough or sharp edges by chipping or grinding. Surfaces and joints shall be sandblasted to "near white metal" in accordance with SSPC-SP 10 and cleaned of all dust by vacuuming or air brushing. After cleaning, surfaces shall be kept free of fingerprints and other contamination. Local surface cleaning may be accomplished using a clean, lint-free cloth and industry approved liquid detergent. Coating shall not be applied if the oil/water separator or the ambient temperature, is below 15 degrees C. Sprayed resin material shall be heated to 32 degrees C. prior to and during the spraying operation.

Catalyst concentration shall be varied to compensate for variation in humidity and temperature. A thin coat of resin-catalyst mixture shall first be applied to the area being worked then followed by the full thickness application of a chopped glass fiber-resin catalyst. After application, the coating shall be rolled with special slotted rollers in full motion with overlapping passes along the entire oil/water separator, to remove all air bubbles and pack all loose strand ends. A seal coat of resin-catalyst mixture, without chopped fiber, shall then be applied to the entire oil/water separator. The final thickness shall be not less than 3.2 mm at any point.

2.1.2.2 Examination and Testing of Coating

Coating shall be examined for flaws, tested for holidays, and its thickness shall be measured as a Contractor Quality Control requirement. The Contractor shall provide the facilities, personnel, and equipment for testing for holidays and measuring thickness. Thickness of coating shall be measured with a commercial film-thickness gage. Directly prior to placement, coating shall be tested with an electric flaw detector, equipped with a bell, buzzer, or other type of audible signal that operates when a holiday, pinhole, or other defect is detected. The holiday test shall be performed at dielectric resistance of 35,000 volts or that voltage which is specified (in writing) by the manufacturer. A Tinker and Razor model AP-W Holiday Detector or equivalent at 35,000 volts is acceptable. Check of the holiday detector potential may be made by the Contracting Officer at any time to determine the suitability of the detector. Damaged areas, including areas damaged by thickness testing, shall be repaired with materials identical to those used originally and, after drying, shall be retested electrically as previously specified. Record of test and test reports shall be submitted to the Contracting Officer together with the Construction quality Control daily report.

2.1.3 Glass Fiber Reinforced Plastic (FRP) Oil/Water Separator

The oil/water separator shall conform to the requirements of UL and NFPA Codes and Standards. In addition it shall meet the following criteria:

- a. External hydrostatic pressure: When buried in the ground, the oil/water separator shall be capable of withstanding 900 mm of water over the top of the tank with a 3:1 safety factor.
- b. Surface Loads: When installed according to manufacturer's installation instructions, oil/water separator shall be capable of withstanding H-20 axle loads.
- c. Internal Load: Oil/water separator shall withstand a 34.5 kPa pressure test with a 5 to 1 safety factor.

2.1.3.1 Pipe and Fittings

Pipe and fittings for glass fiber reinforced plastic storage tanks (FRTP) shall conform to the requirements of ASTM D 2996.

2.1.4 Concrete Oil/Water Separator

Each structure shall conform to the requirements of UL and NFPA Codes and Standards. Construction shall be of reinforced concrete, plain concrete or

precast reinforced concrete.

2.1.4.1 Concrete

Unless otherwise specified, concrete and reinforced concrete shall conform to the requirements for Class A concrete under Section 03302, CONCRETE FOR BUILDING CONSTRUCTION. The concrete mixture shall have air content by volume of concrete, based on measurements made immediately after discharge from the mixer of 5 to 7 percent when the maximum size of coarse aggregate exceeds 38 mm. Air content shall be determined in accordance with ASTM C 231. The concrete covering over steel reinforcing shall be not less than 25.4 mm thick for covers and not less than 38 mm thick for walls and flooring. Concrete covering deposited directly against the ground shall have a thickness of at least 76 mm between steel and ground. Expansion-joint filler material shall conform to ASTM D 1751, ASTM D 1752, or AASHTO M 33 or shall be resin impregnated fiberboard conforming to the physical requirements of ASTM D 1752.

2.1.4.2 Precast Reinforced Concrete Structures

Precast reinforced concrete structures shall conform to ASTM C 858.

2.1.5 Storing, Handling, and Placing of Coated Oil/Water Separator

Procedures shall be executed with care and in a manner that will minimize damage to the coating and will not reduce its effective protective value. The coated oil/water separator shall be placed in position carefully and with a minimum of handling. Damaged surfaces shall be cleaned of rust and dirt, if any, and coating reapplied to match adjacent surfaces by and at the expense of the Contractor. Backfill shall not be started until the in-place oil/water separator has been inspected and certified by the Contracting Officer to be ready for backfilling specified in SECTION: 02315 EXCAVATION FILLING AND BACKFILLING FOR BUILDINGS.

2.1.6 Piping

Steel piping installed underground shall be thoroughly cleaned of foreign matter by wire brushing and solvent cleaning before field application of coating. Piping shall be coated as specified for oil/water separator or shall be field prime coated and immediately wrapped with plastic tape applied with a 50 percent overlap. Prior to installing tape, the piping shall be tested and the joints and fittings shall be coated with material identical to that used on the pipe. Excavation and backfilling shall conform to Section: 02315 EXCAVATION, TRENCHING, AND BACKFILLING FOR UTILITIES SYSTEMS.

2.1.7 Leak Detection System

Leak detection system shall indicate by an audible alarm and indicator light the occurrence of a leak in any part of the oil/water separator, and integral storage tank. The system shall be the electronic float type as manufactured by Mallory/Emhart or the liquid filled type as manufactured by Owens Corning, or other type of detector as approved for use in the State of Arizona. For monitoring backfill area, acceptable devices include gas detectors, observation wells, and thermal conductivity sensors.

2.1.7.1 Leak detection system

Leak detection system shall be UL listed for use with hydrocarbon fuels.

All system components except the alarm panel shall be intrinsically safe for Class 1, Division 1, Group D.

2.1.7.2 Complete Product

Complete product and installation data shall be submitted for approval. All sensors, liquids, cables, conduits, piping, hangers, control and alarm panels, accessories and appurtenances required for a complete installation per manufacturer's recommendation shall be provided.

2.1.7.3 Observation

Observation wells shall be provided where the oil/water separator is anchored in the groundwater during normal operation. They may employ any of the types of leak detectors previously discussed to provide continuous monitoring.

(1) Observation wells shall consist of a 102 mm diameter (Schedule 40) PVC pipe driven into the tank excavation. Well screens shall be provided and have a slot size of 0.5 mm, and shall be extended to grade and covered with a waterproof cap which is capable of being sealed.

(2) All observation wells shall be obviously identified, including the military installation name, well number, type of installation or device installed, and key construction data such as depth, hole and casing diameters, and location of screened or perforated intervals. All observation well caps shall be provided with locking means with access availability to the installation.

2.1.7.4 Oil/water Separator and Integral Storage Tank

The oil/water separator and integral storage tank shall be monitored by the leak detection system.

2.1.8 Tank Accessories

Tappings of sufficient number and proper size to accommodate all connections shall be provided in oil/water separator.

2.1.9 Piping Material

2.1.9.1 Steel Pipe

Pipe shall be Schedule 40 black steel pipe; ASTM A 53 with 0.67 kN malleable iron banded screwed fittings and steel couplings.

2.1.9.2 Fiberglass Reinforced Plastic (FRP) Pipe

FRP pipe shall only be used underground and shall be compatible with the fuels specified. All FRP materials shall be the products of a single manufacturer. Before the purchase of pipe or fittings, the Contractor shall submit a certificate stating that the FRP pipe and fittings shall be manufactured to MS MIL-P-29206 requirements and that factory certified tests have been satisfactorily performed to verify that short-term rupture strength is 59.25 MPa or greater when carried out in accordance with ASTM D

1599. The pipe shall be suitable for a normal working pressure of 1.03 MPa, surge pressures of 1.89 MPa and fuel temperatures up to 65 degrees C. The pipe shall have integral bell and spigot or straight coupled joints. Joints shall be prepared in the factory as specified by the manufacturer. All factory made joints shall be hydrostatically tested in an unrestrained condition to 1.89 MPa for five minutes. No more than 12 m of pipe shall be preassembled either in the factory or in the field. All factory joints shall be permanently identified by a special marking. The pipe manufacturer shall check and verify the diameter of all factory-prepared joints before shipment.

2.1.10 Unions

Unions for steel pipe shall be 1.13 kN, threaded malleable iron, ANSI B16.3, ground joint, brass to iron seat, black to match piping.

2.1.10.1 Insulating Unions

Insulating unions at locations specified shall be an insulating flange, or unions, as applicable; F.B. Maloney, Walter C. Vallett, Service Engineers, Central Plastics, Corro-Ban Products, Epco, or approved equal, constructed so that the dissimilar pipes being connected are completely insulated from each other with no metal to metal contact, and suitable for service on which used. Insulating couplings shall not be used.

2.2 OVERFILL PROTECTION (INTEGRAL STORAGE TANK)

a. An appropriate overfill prevention system will be required unless it can be demonstrated that an equivalent degree of protection exists within the proposed underground storage facility.

b. An appropriate overfill protection device shall be a device that prevents continual spillage from occurring as a result of filling operations. This device shall also preclude the contact of any temporarily held product with any potential ignition source. All proposed overfill protection devices are subject to approval by the Contracting Officer.

2.2.1 Overfill Prevention System Devices (Integral Storage Tank)

2.2.1.1 Level Sensing Devices

a. Tape Float Gauge-The device shall provide a local (above the tank) readout of both oil and water levels while prohibiting vapor loss, and interface with electronic or pneumatic controls for the purpose of alarm and shut-off response.

b. Float Vent Valves - Float vent valves are devices used to prevent overfilling of underground tanks. When installed in the tank's vent line, the float shall close the vent line when high liquid level is attained, thus blocking the escape of air. This action shall cause the pressure inside the storage tank to equalize with the discharge head in the tank truck, thereby interrupting the flow of liquid.

c. Capacitance Sensors - These devices shall operate based on the

electrical conductivity of fluids used to monitor Liquid Level. These devices shall consist of a rod as one electrode and the other electrode being the metallic tank wall. The electrical capacitance between the electrodes shall measure the height of the interface along the rod electrode. The rod shall be electrically insulated from the liquid in the tank by a coating of plastic.

2.2.1.2 High Level Alarms

Overfill alarms shall be visual or audible instruments which are remotely mounted. Alarms shall be mounted as directed by the Contracting Officer.

2.2.1.3 Automatic Shut-Off Controls

Automatic shut-off control systems shall interface with level sensing devices to: 1) prevent tank, and oil/water separator box overfilling by shutting off the tank loading pump at a preset high level; 2) operate various flow valves to control product flow. These control systems shall receive a signal from the level sensing device which is transmitted electrically or pneumatically to the control system. Pneumatic devices shall be provided with a regulated supply of clean and dry instrument air, generally at 138 kPa. Electric (or electronic) devices require 115V line voltage.

2.3 PIPING SYSTEMS

2.3.1 General Provisions

The design, fabrication, assembly and testing of piping systems to contain flammable and combustible liquids shall be in conformance with the applicable Sections of ANSI B31.1, for Pressure Piping and NFPA 30, Flammable and Combustible Liquids Code. All piping systems connected to underground storage facilities shall provide for leak detection and continuous monitoring.

2.3.2 Testing Sequence to Be Performed By Contractor:

- Isolate the piping system at both ends.
- Soap all joints.
- Gradually pressurize to 150% of working pressure or at least 345 kPa. The gauge used shall have a full scale reading of no more than twice the test pressure (e.g., if the test pressure is 345 kPa, the gauge shall be no more than 689 kPa full scale).
- Inspect for bubble formation; monitor for a pressure drop for one-half hour.
- No tightening or repairs shall be attempted while the system is pressurized.
- Wrap or coat joints in preparation for backfilling operations.

PART 3 EXECUTION

3.1 INSTALLATION

Oil/water separator and piping shall be installed in accordance with NFPA standards, the provisions of the State Health and Safety Code, and the manufacturer's recommendations. Return and vent pipes shall be graded down toward tanks at not less than 7.8 mm per meter without loops or straps.

3.1.1 Oil/Water Separator

Oil/Water separator shall be visually inspected for damage at delivery, just prior to installation and prior to backfilling. Prior to installation, oil/water separator shall be tested above ground at 34.4 kPa pressure and fittings shall be soaped and checked for leaks.

a. Hole size shall be large enough to allow a minimum of 300 mm from ends and sides to oil/water separator to hole walls. The oil/water separator holes shall be deep enough to allow a minimum of 150 mm backfill bed over the hole bottom. Oil/water separators not subjected to traffic loads shall have a minimum cover of 600 mm backfill, or 300 mm backfill plus 100 mm reinforced concrete. Depth of cover shall not exceed 2.1 m over oil/water separator.

b. Backfill material shall be naturally rounded aggregate, clean and free flowing with particle size not less than 3.2 mm or more than 19 mm in diameter.

3.1.2 Leak Detection System

A leak detection system shall be installed in accordance with manufacturer's recommendations. The extractor, fill, and recovery pipes and boxes shall be wrapped in accordance with Subparagraph, Wrapping and Coating Steel Pipe.

3.1.3 Testing

A general performance test to demonstrate the proper operation of the tank and piping shall be made by the Contractor and in the presence of the Contracting Officer or his representative. Oil/water separator shall be isolated from piping when pressure testing piping.

3.1.3.1 Tank

The tank shall be pressure tested with air per manufacturer's recommendations and proved tight before and after backfilling.

3.1.3.2 Leak detection

The leak detection system shall be tested by a representative of the manufacturer and witnessed by the Contracting Officer. The tests shall consist of a visual inspection and an electronic test with results submitted to the Contracting Officer.

3.2 INSTALLING FITTINGS

3.2.1 Unions

Unions shall be installed at each threaded or soldered connection to equipment, tank or oil/water separator. Locate unions so piping can be easily disconnected for removal of equipment or tank.

3.2.2 Insulation Union Locations

Insulation unions shall be provided at the following locations:

- a. At each end of buried ferrous line, except as otherwise shown.
- b. At vent lines.

3.2.3 Wrapping and Coating Steel Pipe

Steel pipe buried in ground shall be wrapped or coated.

3.2.3.1 Wrapped Steel Pipe

Wrapped steel pipe shall be wrapped with pressure sensitive polyvinyl chloride or polyethylene tape having nominal thickness of 20 mils. Pipe shall be thoroughly cleaned and primed as recommended by the tape manufacturer.

3.2.3.2 Tapes

Tapes shall be tightly applied with 12.7 mm minimum, uniform lap, free from wrinkles and voids with approved wrapping machines and experienced operators to provide not less than 20 mil thickness.

3.2.3.3 Plastic coating

Plastic coating on steel pipe shall be factory applied. Field joints, fittings, and valves for coated steel pipes shall be wrapped to provide continuous protection. Coating imperfections and damage shall be repaired to the satisfaction of the Contracting Officer.

3.2.3.4 Field joints

Field joints and fittings shall be covered by wrapping polyethylene or polyvinyl tape specified for wrapping pipe, except 2 layers or 10 mil thick tape shall be used. Wrapping at joints shall need a minimum of 150 mm over adjacent pipe coverings. Width of tape for wrapping fittings shall not exceed 50.8 mm. Adequate tension shall be applied so tape will conform closely to contours of fittings. Putty tape insulation compounds approved by the Contracting Officer shall be used to fill voids and provide smooth even surfaces for application of tape wrap.

3.2.3.5 Piping

Piping using RTRP piping and steel fittings shall have the fittings wrapped with 30 mils of wrapping.

3.3 CATHODIC PROTECTION

Cathodic protection shall be provided for all metallic piping installed underground and shall be installed as specified in Section 16640 CATHODIC PROTECTION SYSTEM (SACRIFICIAL ANODE).

-- End of Section --